

IN THE CLAIMS:

1. A probe station for high resolution, low current probing of a DUT, the probe station comprising:

a vacuum housing having an interior space in which a DUT is disposed with the interior space under vacuum conditions during testing operations;

a high resolution microscope extending into the interior space for acquiring images of the DUT;

a probe assembly in the housing interior space for taking low current measurements from the DUT;

a carrier in the housing space for supporting the DUT during testing operations;

a drive system for shifting at least one of the probe assembly and the carrier to a predetermined test position; and

means for causing precision movements of the one of the probe assembly and the carrier via operation of the drive system in the vacuum housing despite generation of heat energy upon drive system operation.

2. The probe station of claim 1 wherein the heat shield comprises a heat insulating or shield device of the drive system to allow for precision shifting of the one of the probe and the carrier by the drive system in the vacuum housing.

3. The probe station of claim 1 wherein the drive system includes a motor and the means for causing precision movements comprises an output shaft assembly of the motor of a predetermined heat insulating material.

4. The probe station of claim 3 wherein the output shaft assembly includes a lead screw that is of the predetermined heat insulating material which

comprises at least one of a ceramic material, sapphire material and ruby material having a low coefficient of thermal expansion.

5. The probe station of claim 1 wherein the drive system includes a motor and a motor output shaft assembly and the means for causing precision movements comprises a coupling made of a predetermined heat insulating material which insulates portions of the output shaft assembly from each other in order to minimize heat transfer from one portion to another portion.

6. The probe station of claim 1 wherein the drive system includes a motor and a drive shaft that is rotated upon operation of the motor for shifting the one of the probe and the carrier by the drive system in the vacuum housing; and

the means for causing precision movements comprises a shield disposed between the motor and the drive shaft to deflect heat or energy from the operating motor away from the drive shaft in the vacuum housing.

7. The probe station of claim 6 wherein the shield forms an annular ring about the motor and extends out from the motor at an angle sufficient to deflect radiated heat or energy from the operating motor away from the drive shaft in the vacuum housing.

8. The probe station of claim 1 further comprising an environmental control system associated with the housing and including a heat transfer fluid that substantially maintains a desired temperature within the vacuum housing so that accurate measurements may be taken from the DUT.

9. The probe station of claim 8 wherein the environmental control system further includes a conduit disposed within the vacuum housing for carrying the heat transfer fluid therein.

10. The probe station of claim 8 wherein the environmental control system conduit comprises a group of lines positioned about the at least one of the probe assembly, carrier and drive system, the lines carrying the heat transfer fluid for transferring heat to maintain a desired temperature within the vacuum housing.

11. A probe station for testing a specimen, the probe station comprising:
a housing defining an interior space within which a specimen is placed for testing;

a carrier for supporting the specimen during testing;

a probe assembly located within the interior space for testing the specimen; and

an environmental control system associated with the housing and including a heat transfer fluid that substantially maintains the interior space of the housing at a desired temperature for testing.

12. The probe station of claim 11 wherein the housing comprises a vacuum chamber and the environmental control comprises a conduit disposed within the chamber for carrying the heat transfer fluid therein.

13. The probe station of claim 11 further comprising a drive system for shifting at least one of the probe assembly and the carrier to a test position; and

the environmental control system comprises a conduit positioned about the drive system for transferring heat generated therefrom to the fluid and out of the interior space so that the specimen may be tested at a desired temperature.

14. The probe station of claim 11 wherein the environmental control system comprises at least one fluid carrying conduit that carries the fluid to pass through the housing to transfer heat from within the interior space out of the housing.

15. A method for precision low current probing of a DUT, the method comprising:

providing a probe station housing that defines a chamber within which the DUT is tested;

running a fluid carrying conduit in the chamber;

flowing a heat transfer fluid through the conduit; and

transferring heat from the chamber to the flowing heat transfer fluid for testing the DUT substantially at a desired temperature.

16. The method of claim 15 further comprising creating a vacuum in the housing to reduce the amount of noise present during testing of the specimen.